Begränsad delning

Course Syllabus
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Autumn 2026

2026-02-05
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UMEÅ UNIVERSITY
DEPARTMENT OF MATHEMATICS
AND MATHEMATICAL STATISTICS

Computational Statistics (Beräkningsstatistik)

Credits: 7.5 ECTS
Course Period: November – December 2026
Main field of study: Mathematical Statistics
Progress Level: PhD
Grading scale: Pass/fail
Course coordinator: Natalya Pya Arnqvist

Prerequisites:
The course is intended for PhD students in Statistics or related fields. Students are expected to have a foundation in statistical inference, equivalent to a completed second-cycle course of at least 7.5 credits, or equivalent knowledge gained through alternative academic or professional experience. They should also be familiar with matrix algebra and have basic knowledge of using the R programming language.

Objective:
The course provides a practical understanding of the fundamentals of numerical computation in statistics, with a focus on R. The goal is to help students develop statistical programs that are stable, efficient, and numerically accurate.

Contents:
The course starts with a slightly more systematic view of R and then covers the following topics:

1) stochastic simulation techniques,

2) matrix computation,

3) design, debugging, and testing,

4) numerical optimization,

5) numerical differentiation and integration,

6) graphics,

7) simulation for inference

Form of instruction:
Teaching consists of lectures and computer lab sessions covering the material introduced during the lectures.

Examination:
The course is examined through two individual hand-in assignments. The course is passed if both assignments are passed.

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Literature:

1) Monahan, J. F. (2011). *Numerical Methods of Statistics*. Cambridge University Press.

2) Nocedal, J. and Wright, S. J. (2006). *Numerical Optimization,* 2nd ed. New York, Wiley.

3) Watkins, D. S. (2004). *Fundamentals of Matrix Computations*. John Wiley & Sons.

4) Ripley, B. D. (2006). *Stochastic Simulation*. John Wiley & Sons.

5) Wood SN (2015). *Core Statistics*. Cambridge University Press, New York.